PATTERN OF CARDIOVASCULAR AND PULMONARY LESIONS SEEN IN AN AUTOPSY SERIES OF SUDDEN AND UNEXPECTED DEATHS

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ABSTRACT

BACKGROUND

Cardiovascular diseases continue to be the most common generic cause of sudden and unexpected death. Atherosclerotic coronary heart disease and acute myocardial infarction are the most prevalent forms of fatal cardiac disease observed at autopsy. Other cardiac lesions and pulmonary lesions are frequently listed as a cause of death, but the prevalence of such lesions as the cause of death and incidental findings in the general population is unknown.

MATERIALS AND METHODS

Observational study of 500 forensic autopsies which were evaluated for cardiovascular and pulmonary pathologies.

RESULTS

The most frequently observed major finding was coronary artery disease. Of the 500 cases, cardiac disease was noted in 143 cases, pulmonary disease was in 79 cases and other vascular disease in 5 cases. Cardiovascular and pulmonary diseases constitute the major proportion of mortality in unexpected deaths.

CONCLUSION

The pattern of mortality shown in this study provides a fair idea of the burden of cardiovascular and pulmonary pathologies in Thrissur district of Kerala, although it is not a population-based data. Cardiovascular and pulmonary pathologies constitute the major share of mortality in unexpected deaths.

KEYWORDS

Sudden and Unexpected Deaths, Autopsy, Cardiovascular Pathology, Pulmonary Pathology.

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BACKGROUND

An autopsy is a medical procedure that consists of a thorough examination performed on a body after death, to evaluate disease or injury that may be present and to determine the cause and manner of a person's death. An autopsy may be required in deaths that may have medical and legal issues. Causes of unnatural and sudden death are many, with accidents being the most common. The global burden of cardiovascular disease (CVD) has been increasing over time. At the beginning of the 20th century, CVD accounted for less than 10 percent of all documented deaths worldwide. At the start of the 21st century, it was the attributable factor in 30 percent of all deaths globally with more than 80 percent of those occurring in low and middle income countries.¹

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Cardiovascular and pulmonary disease continues to be the most common generic causes of sudden and unexpected deaths.² The study focuses on the frequency and pattern of cardiovascular and pulmonary disease as the cause in sudden and unexpected deaths. We selected these two systems because they are most common attributable factors in sudden and unexpected deaths.²

Objectives

To assess the pattern of cardiovascular and pulmonary pathologies in unexpected deaths where cause of death was not clear and the age and sex distribution of various lesions in the above setting.

MATERIALS AND METHODS

The study was conducted in the Department of Pathology, Government Medical College, Thrissur, Kerala. It is a retrospective study of medicolegal autopsies that were sent to the Department of Pathology from the Department of Forensic Medicine, Government Medical College, Thrissur, Kerala. All cases had undergone a complete autopsy examination. Immediate cause of death was defined as the final disease or complication directly causing death. The contributing cause of death was defined as other significant conditions or disease that contributed to death but was not the immediate cause of death.

The Cases have been sent for Pathological Examination from Department of Forensic Medicine for-

1. Confirmation of the diagnosis made at autopsy.
2. For identification of the cause of death when there was no definite conclusion at autopsy. In the present study, these cases were analysed with respect to the cardiovascular and pulmonary pathologies.

Gross examination of the specimens were done and tissue samples were taken from relevant areas and paraffin blocks made. 5 micron thin sections were cut and were stained with H&E. The heart, great vessels and lungs were examined in all cases. Special stains (Reticulin, Masson Trichrome, EVG, GMS stain for Fungi and AFB) were done wherever required.

Duration of the Study

March 2007 to Feb 2013 (6 Years).

Sample Size

500 cases.

Inclusion Criteria and Study Design

Medicolegal autopsies conducted in the Department of Forensic Medicine, Government Medical College, Thrissur, Kerala, were selected. All cases with a known cause of death like RTA (except when cause of death was not obvious), burns, poisoning, blast injury, assault, fall from height were excluded.

RESULTS

During a period of 5 years and 8 months from March 2007 to November 2012, a total of 500 specimens of autopsies were studied.

Cardiac Pathology

22.4% (112 cases) were found to have coronary artery disease. Age of cases ranged from 21 years to 95 years of age. Maximum number of CAD cases was in the sixth decade (28 cases) and fifth decade (27 cases). Male to female ratio of CAD was 12:1 in this series. Females were mostly affected in the fourth decade (4 cases) and fifth decade (3 cases).

Incidence of myocarditis was 3%, distributed over an age distribution of first to sixth decade with an almost equal sex predilection (8 males and 7 females).

Hypertrophic cardiomyopathy was found in 6 cases all of whom were males and all of them were in the age group 3rd and 4th decade.

Valve pathology were of myxoid degeneration (2 cases of MVP) and of rheumatic nature (3 cases affecting both mitral and aortic valves) excluding the single case of infective endocarditis of mitral valve which was neither rheumatic nor myxoid degeneration.

There was one case each of ARVD, EMF and Neuroendocrine carcinoma. The neuroendocrine carcinoma was in a 78-year-old female who had presented with sudden respiratory distress and the tumour was infiltrating the cardiac muscle. The case of ARVD was in a 36-year-old male with sudden death which showed extensive fibrofatty infiltration of the right ventricular wall.

Pulmonary Pathology

The maximum number of pulmonary pathology was from lobar pneumonia (5.4%) and was seen over 20 to 80 years of age. Next common finding was pulmonary tuberculosis

(4.2%) all of which had characteristic caseation with necrosis. Among the Tuberculosis cases, six were part of miliary tuberculosis and one was a known case with HIV positive status.

There were 8 cases of interstitial pneumonia and 6 cases of bronchopneumonia and one case of fungal pneumonia. CVC lung was seen in 6 cases.

There were 2 cases of epiglottic abscess; both were young males (27 and 31 years old) who were labourers from northern part of India who had come to Kerala for employment (manual labourers).

5 cases, 3 males and 2 females had shown extensive emphysematous changes and 1 case, a 38-year-old male had typical histological features of ARDS. 2 cases had features of Status asthmaticus, one a 30-year-old male and the other an 18-year-old female.

Vascular pathologies, PPHN, Dissection of aorta, pulmonary thromboembolism, Fat and bone marrow embolism and Amniotic fluid embolism were present in one case each constituting a total of 5. Dissection was in a 76-year-old female who was found dead and had no preceding history of any significant illnesses. Fat and bone marrow embolism was found in a 26-year-old male RTA victim who died 3 days after the RTA. Pulmonary thromboembolism was seen in a 32-year-old female without any relevant past history.

Coronary artery disease	112
Myocardial bridging	1
Myocarditis	15
Infective endocarditis	1
HCM	6
EMF	1
Neuroendocrine Tumour	1
Valvular heart disease	5
ARVD	1
Total	143

Table 1. Cardiac Pathology Frequency

Age	Male	Female	Total
21-30	13	1	14
31-40	17	4	21
41-50	27	3	30
51-60	28	1	29
61-70	10	3	13
71-80	4	0	4
81-90	1	0	1
91-100	0	0	0
Total	100	12	112

Table 2. Age Distribution of CAD

ARDS	1
Emphysema	5
Lobar pneumonia	27
Bronchopneumonia	6
Fungal pneumonia	1
CVC Lung	6
Interstitial pneumonia	8
Bronchial Asthma	2
Tuberculosis	21
Epiglottic abscess	2
Total	79

Table 3. Pulmonary Pathology

Primary pulmonary hypertension	1
Dissection or Aorta	1
Embolism (Fat and Bone marrow)	1
Amniotic fluid embolism	1
Pulmonary thromboembolism	1
Total	5
Table 4. Vascular Pathology	

Age	Males	Females	Total
21-30	2	0	2
31-40	5	1	6
41-50	9	0	9
51-60	3	1	4
61-70	3	0	3
71-80	1	0	1
81-90	1	1	2
91-100	0	0	0
Total	24	3	27
Table 5. Age and Sex Distribution of Lobar Pneumonias

Figure 1. Microscopy of Biopsy from Posterior Right Ventricular Wall Showing Features of ARVD. Case of Sudden Death of a 35-year-old Female.

Figure 2. Case of Rheumatic Carditis Showing Aschoff Bodies

Figure 3. Case of Myocardial Infarction Showing Cardiac Muscle with Coagulative Necrosis

DISCUSSION

The goal of this study was to ascertain the frequency of various cardiovascular and pulmonary pathologies at autopsy where a definite cause of death was not clear or the findings at autopsy required histopathology confirmation. From India, very few studies have been conducted in this area. We looked specifically the cardiovascular and pulmonary pathologies, because they are the systems frequently associated with mortality.

Atherosclerotic coronary heart disease and myocardial infarction are the most frequent pathologies noted at autopsy. Other cardiovascular lesions and also pulmonary lesions are frequently listed as cause of death, but their prevalence in the general population is unknown.

In this study, 500 autopsy cases were studied where a definite cause of death was unclear during autopsy or required histopathology confirmation. Of the 500 cases, various cardiac disease were observed in 143 cases, pulmonary disease in 79 cases and vascular disease in 5 cases.

Catellier MJ² et al have reported that the incidence of atherosclerotic coronary heart disease was the most common major finding observed in 16% cases. In the present study, the observed frequency of coronary artery disease was 22.4%. (112/500).

Shirani J³ and colleagues reported an incidence of cardiac death in octogenarians of 53% and the incidence of coronary artery disease was 34.7%. The higher incidence in their series is likely due to the higher age group selected.

Shirani J³ and colleagues reported the incidence of vascular disease as 13%. In contrast the frequency in the present study was low (1%). In an autopsy series published by Waller BF⁴ and colleagues, the incidence of CAD was 18%. They observed 5% incidence of MVP in contrast to a lower incidence of 0.4 in our series. Contrary to a high 24% incidence of myocardial bridging in their study, we just had one case of similar pathology.

The fact that rheumatic heart disease is progressively coming down in the society is evidenced by the markedly low incidence of valvular heart disease in our study. All cases of HCM had no other pathology in any other organs indicating the likely cause of death, arrhythmia. Myocarditis accounted for up to 44% of fatal events in major series on cardiac sudden death in the young.⁵

Pulmonary diseases were present in 15.8% of total cases of which the maximum share was of Lobar pneumonia (34.2%) followed by Tuberculosis (26.5%). Other pulmonary pathologies constituted minor shares including Emphysema. In our study, emphysema was present in 5 of the 500 cases (1% of total cases.) This is in sharp contrast to other series published. (Tariq Mahmood Tahir and colleagues, 40%, and Latif and coworkers,⁶ 43% cases). Tariq et al reported 19.0% incidence of tuberculosis, whereas in our study the incidence of tuberculosis was 4.2%. Male preponderance of tuberculosis is reported in many autopsy series. Norboo et al and Tariq et al reported cases of silicosis in their series, but we didn't have even a single case in our series.⁷ This is attributable to the geographical difference and the occupation of the people involved in the area. Niazi found 22 cases of pneumonia (17.88%) in her study of pulmonary embolism in a total of 123 medico-legal autopsy cases. Corresponding figure in our series is 8.4% lobar pneumonia, interstitial pneumonia, bronchopneumonia and fungal pneumonia put together. The higher incidence of pneumonia in her study could be due to the reason that her study included 30% hospitalised patients who remained in the hospital for a longer or shorter period of time.

Various vascular pathologies was noticed in 13% of cases in an autopsy study of octogenarians by Shirani J and colleagues.³ We observed various vascular pathologies in only 1% of cases. This could be due to the inclusion of cases of extreme age in their series. Regarding pulmonary thromboembolism we came across just one in the entire series. This incidence is in contrast with previously reported studies of Sandler et al⁸ and Pineda et al⁹ which was found to be 10% and 9.1% respectively. This difference in incidence of PE could be the result of variability in the threshold for autopsy in cases of unconfirmed antemortem diagnosis.

This study has several limitations: the single centre design and obvious selection bias limit generalisability. Because this is a retrospective study, some specific data are lacking regarding events such as complete profile of risk factors of cardiovascular and pulmonary diseases, description of the clinical manifestations presented by victims before death or autopsy protocols. However, the study was performed in an academic tertiary care centre in which practices should be on par with other large hospitals. Additionally, other studies at similar institutions are available for comparison.

CONCLUSION

Cardiovascular and pulmonary pathologies constitute the major share of mortality in unexpected deaths. The patterns of mortality shown in this study may provide a fair idea of the burden of cardiovascular and pulmonary pathologies in Thrissur district of Kerala, although it is not a population-based data. Therefore, to obtain a national pattern of CVD mortality there is a big need for further studies.

This may start with the collation of autopsy cases in all the major hospitals across the country, and subsequently the development of a population-based surveillance system. In the interim, specific studies may be conducted exploiting the demographic and surveillance systems that exist in the country.

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